COMMONWEALTH OF VIRGINIA
Department of Environmental Quality
Valley Regional Office

STATEMENT OF LEGAL AND FACTUAL BASIS

Columbia Gas Transmission Corporation
Shenandoah Compressor Station
Page County, Virginia
Permit No. VRO81139

Title V of the 1990 Clean Air Act Amendments required each state to develop a permit program to ensure that certain facilities have federal Air Pollution Operating Permits, called Title V Operating Permits. As required by 40 CFR Part 70 and 9 VAC 5 Chapter 80, Columbia Gas Transmission Corporation has applied for a renewal of the Title V Operating Permit for its natural gas compressor station in Page County, Virginia. The Department has reviewed the application and has prepared a draft Title V Operating Permit.

Engineer/Permit Contact:_____ Date:_____

Air Permit Manager:_____ Date:_____

Deputy Regional Director:_____ Date:_____

FACILITY INFORMATION

Permittee
Columbia Gas Transmission Corporation
P.O. Box 1273
Charleston, WV 25325-1273

Facility
Shenandoah Compressor Station
On northwest side of State Route 685, approximately 1.7 miles southwest of the northernmost intersection with U.S. 340
Page County, Virginia

AIRS ID No. 51-139-0027

SOURCE DESCRIPTION

SIC Code 4922 -Natural Gas Compressor Station

This facility is a natural gas compressor station. Natural gas is received via gas pipelines from an upstream compressor station, compressed, and pumped into outlet pipelines for transmission to a downstream station. The natural gas is compressed using two turbines, site-rated at 5,027 horsepower (hp) each. On-site auxiliary equipment includes one generator rated at 135 hp. Also on-site is a 2.1 MMBtu/hr heating system boiler.

The existing Title V permit for the facility was issued on April 5, 1999 and expires on April 5, 2004. The existing Title V permit allows operation of two turbines (each rated at 5,027 hp), one generator rated at 135 hp and one 2.1 MMBtu/hr boiler.

The facility is a Title V major source of nitrogen oxides. This source is located in an attainment area for all pollutants. The facility is currently permitted under a minor NSR permit dated August 23, 1991, and amended on January 27, 1994, March 10, 1995 and August 6, 1998. The permit amendment on January 27, 1994 has been superseded by subsequent amendments.

CHANGES TO EXISTING TITLE V PERMIT

The following changes have been made to the existing Title V permit:

I. Facility Information: The names of the responsible official and contact person have been updated:

V. Insignificant Emission Units: Equipment leaks and blowdown has been added to insignificant emission units to reflect the current application.

VII. General Conditions: The language of seven general conditions (Section VII) has been updated to reflect current boilerplate format. Conditions changed are VII.B, C, D, E, F, J and U. Also, Condition VII. AA has been added to reflect the current boilerplate.

COMPLIANCE STATUS

The facility is inspected once a year. The facility was last inspected on July 22, 2002, and was determined to be in compliance.

EMISSION UNIT AND CONTROL DEVICE IDENTIFICATION

The emissions units at this facility consist of the following :

Table I. Significant Emission Units

Emission Unit ID	Stack ID	Emission Unit Description	Size/Rated Capacity*	Pollution Control Device Description (PCD)	PCD ID	Pollutant Controlled	Applicable Permit Date**
Combustion Turbines							
1	EO1	Combustion Turbine #1 (Natural gas fired), Allison 501-KC5 (Constructed 1992)	48.6 MMBtu/hr (Input) 5,027 hp (Output)	-	-	-	8/23/1991, 1/27/1994, 3/10/1995, and 8/6/1998
2	EO2	Combustion Turbine #2 (Natural gas fired), Allison 501-KC5 (Constructed 1992)	48.6 MMBtu/hr (Input) 5,027 hp (Output)	-	-	-	
Fuel Burning Equipment							
G1	G1	Auxiliary Generator Waukesha F11GSI (Constructed 1992)	1.6 MMBtu/hr (Input) 135 hp (Output)	-	-	-	8/23/1991, 1/27/1994, 3/10/1995, and 8/6/1998
BLR1	BLR1	Heating Boiler, Hydrotherm MR-1500-BPV (Constructed 1992)	2.1 MMBtu/hr (Input)	-	-	-	

*The Size/Rated capacity is provided for informational purposes only, and is not an applicable requirement.
**Permit issued on 8/23/91 and amended on 1/27/94, 3/10/95 and 8/6/98.

EMISSIONS INVENTORY

A copy of the 2002 annual emission update is attached as Attachment A. Emissions are summarized in the following tables:

Table II. 2002 Actual Criteria Pollutant Emissions
for the Shenandoah Compressor Station

	Criteria Pollutant Emission in Tons/Year				
Emission Unit	VOC	CO	SO_2	PM_{10}	NO_x
Combustion Turbine#1	0.35	6.16	0.34	0.45	8.78
Combustion Turbine #2	0.39	6.75	0.37	0.49	6.75
Generator	0.00	0.02	0.00	0.00	0.02
Boiler	0.01	0.05	0.00	0.01	0.23
Total	0.76	12.98	0.71	0.94	18.66

Table III. 2002 Actual Hazardous Air Pollutant Emissions
for the Shenandoah Compressor Station

Pollutant	Hazardous Air Pollutant Emission in Tons/Year
Formaldehyde	0.04

EMISSION UNIT APPLICABLE REQUIREMENTS - (Combustion Turbines #1 and #2)

Limitations

The following limitations are state BACT requirements from the minor NSR permit issued on 8/23/91, and amended on 1/27/94, 3/10/95 and 8/6/98. Please note that the condition numbers are from Part I of the minor NSR permit. A copy of the permit is attached as Attachment B with

the amendments as Attachment C, D and E:

Condition 4: NO_x and CO emissions from the turbines shall be controlled by lean fuel-to-air ratio.

Condition 6: Limit on fuel consumption for the turbines.

Condition 9: Emission limits for criteria pollutants for each turbine.

Condition 12: Visible emission limit of 5% for the turbines.

Condition 15: Limit on type of fuel to be used in turbines. Natural gas with a sulfur content of 0.01% or less by weight.

Monitoring and Recordkeeping

The monitoring and recordkeeping requirements in Conditions 7, 17, 18 of the NSR permit have been modified to meet Part 70 requirements.

The permit requires that each turbine shall have a permanently installed fuel flowrate gage, with a cubic feet per second readout and easy accessibility.

The permit includes requirements for maintaining records of all emission data and operating parameters. These records include monthly natural gas consumption (in million cubic feet) by each turbine, DEQ approved pollutant specific emission factors and sulfur content of natural gas.

The fuel consumption limits are based on the turbines operating at the rated capacity of the turbines, based on manufacturer's recommendation. Calculations have been included in Attachment F to demonstrate how the emission limits were obtained.

The permittee shall monitor the sulfur content of the natural gas twice per annum during the first and third quarters of each calendar year, and maintain records of the monitoring. Analysis for sulfur content of the natural gas shall be conducted using one of the approved ASTM reference methods for the measurement of sulfur in gaseous fuels, or an approved alternative method. The reference methods are: ASTM D1072-80; ASTM D3031-81; ASTM D3246-81; and ASTM D4084-82 as referenced in 40 CFR 60.335 (b)(2). Usage of the Barton Model 286 or 342 titration analytical methods are approved alternative methods.

The turbines in operation at the Shenandoah Compressor Station are subject to NSPS Subpart GG. The NSPS contains requirements for SO_2 and NO_X emissions. All of the SO_2 and NO_x requirements from the subpart have been incorporated into the operating permit, satisfying the periodic monitoring requirement. The compliance with SO_2 requirements are demonstrated by complying with the natural gas sulfur content limit. The compliance with NO_x emission requirements are demonstrated by stack testing performed on July 1, 1993. Since the turbines are fueled only by pipeline-quality natural gas with no add-on controls there is no reason to expect the NO_x emissions will exceed those measured during the stack test performed on July 1, 1993.

The hourly emission limits established during the ozone season of April 1 through October 31 for criteria pollutants (SO_2, NO_x, CO and VOC) are based on the manufacturer's specifications at the rated capacity of turbine. Therefore, if the turbines are operated at capacity, or below, there should not be a violation of the hourly emission rates. Calculations have been included in Attachment F to demonstrate how the limits are obtained.

During the cold months, the manufacturer of the turbines (Allison Industrial & Marine Applications Engineering) have recommended different hourly emission rates. As with all turbines, the compressor turbines are sensitive to ambient temperatures which in turn affects the horsepower output and emissions from the turbines. Per the manufacturer, an absolute maximum horsepower is delivered by these turbines when operating at an ambient temperature of 20^{0} F. At this temperature, each turbine deliver 5810 hp and higher emissions are expected. The hourly emission limits established during the non-ozone season of November 1 through May 30 are based on absolute maximum horsepower of the turbines and based upon the manufacturer's recommendations.

Annual emissions from the operation of the turbine will be calculated using the following equation:

$$E = F \times N \times H$$

..... Equation 1

Where:

E = Emission Rate (lb/time period)

F = Pollutant specific emission factors as follows:

SO_2	=	1.22E-04 lb/hp-hr
NO_x	=	3.17E-03 lb/hp-hr
CO	=	2.23E-04 lb/hp-hr
VOC	=	1.28E-04 lb/hp-hr

PM10 = 1.61E-04 lb/hp-hr

N = operating time period
H = horse power rating of the turbine

Calculations have been included in Attachment F to demonstrate how annual emission limits were obtained and practically prohibit the turbines from the ability to exceed the emission limitations specified in the permit.

Conditions A.8, B.4 and B.6 (Part III) were added to the Title V permit in order to make equipment maintenance a federally enforceable requirement in lieu of periodic monitoring for opacity. The "EPA Final Periodic Monitoring Guidance" specifically gives the example of turbines burning pipeline natural gas only, and states that federally enforceable requirements for equipment maintenance can satisfy the requirement for periodic monitoring of compliance with the opacity standard.

Compliance Assurance Monitoring (CAM) Plan Applicability

The CAM plan does not apply to the combustion turbines, as none of the combustion turbines uses a control device to achieve compliance with the emission limitations.

Testing

The permit does not require source emission tests. A table of test methods has been included in the permit if testing is performed. The Department and EPA have authority to require testing not included in this permit if necessary to determine compliance with an emission limit or standard.

Reporting

No specific reporting has been included in the permit.

Streamlined Requirements

Part I, Condition 16 has not been included, as all applicable requirements from NSPS Subpart GG, except for the requirement to determine fuel-bound nitrogen, have been included in the permit. As explained in the attached letter from EPA (Attachment G), nitrogen monitoring can be waived for pipeline quality natural gas, since there is no fuel-bound nitrogen and the free nitrogen does not contribute appreciably to NO_x emissions.

Part I, Condition 14 and Part II, Condition 2 which required Stack testing for NO_x was completed on July 1, 1993. Therefore, these stack testing requirements have not been included.

New source construction and start-up notification requirements in Part II, Condition 1 have not been included.

Facility design and construction requirements in Part II, Condition 3 have not been included.

Part II, Condition 8, regarding invalidation of permit if not constructed within 18 months from the date of the permit, has not been included.

The Combustion Turbines have the following applicable requirements from the NSPS (40 CFR 60) Subpart GG and 9 VAC 5-50-410:

§60.332 (a)(2): Allowable NO_x emissions shall not exceed the following:

$$STD = .0150 \frac{14.4}{Y} + F$$

where:

STD = Allowable NO_x emissions (percent by volume at 15 percent oxygen and on a dry basis).

Y = Manufacturer's rated heat rate at manufacturer's rated peak load (kilojoules per watt hour), or actual measured heat rate based on lower heating value of fuel as measured at actual peak load for the facility. The value of Y shall not exceed 14.4 kilojoules per watt hour.

F = NO_x emission allowance for fuel-bound nitrogen as defined in §60.332 (a)(3)

§60.333: Standard for sulfur dioxide:

$SO_2 \leq 0.015$ vol % at 15% O_2 OR fuel sulfur content ≤ 0.8 wt%

The allowable NO_x emission limit in the minor NSR permit (Condition 9 of 8/23/91 Permit as amended in 3/10/95) is more stringent than the one in Subpart GG (as shown in Attachment F). Therefore, the limit from minor NSR permit has been included in the Title V permit.

The fuel sulfur content requirement in the NSR permit (Condition 15 of 8/23/91 Permit) is more stringent than the one in Subpart GG. Therefore, the limit from the minor NSR permit has been included in the Title V permit.

Remaining general conditions in Part II of the NSR permit have been modified to meet the general condition requirements of 40 CFR Part 70 and 9 VAC 5-80-110.

EMISSION UNIT APPLICABLE REQUIREMENTS - (Emission Units G1 & BLR1)

Limitations

The following limitations are state BACT requirements from the minor NSR permit issued on 8/23/91, and amended on 1/27/94, 3/10/95 and 8/6/98. Please note that the condition numbers are from Part I of the minor NSR permit. A copy of the permit is attached as Attachment B with the amendments as Attachment C, D and E:

Condition 5: Limit on operating hours for auxiliary generator.

Condition 8: Limit on fuel consumption for the boiler.

Condition 10: Emission limits for criteria pollutants for boiler.

Condition 11: Emission limits for criteria pollutants for auxiliary generator.

Condition 12: Visible emission limit of 5% for boiler stack.

Condition 13: Visible emission limit of 10% for the auxiliary generator stack.

Condition 15: Limit on type of fuel to be used in auxiliary generator and heating boiler. Natural gas with a sulfur content of 0.01% or less by weight.

Monitoring and Recordkeeping

The monitoring and recordkeeping requirements in Condition 17 of the NSR permit have been modified to meet Part 70 requirements.

The permit includes requirements for maintaining records of all emission data and operating parameters. These records include yearly natural gas consumption (in million cubic feet) by the boiler, and annual operating hours of the auxiliary generator.

The hourly emission limits established for boiler and auxiliary generator are based on the capacity of the boiler and generator, respectively. Therefore, if the boilers are operated at capacity, or below, there should not be a violation of the hourly emission rates. Calculations have been included in Attachment F to demonstrate how the limits are obtained.

The annual emission limits established for criteria pollutants are based on the natural gas throughput limit and operating hours limit contained within the permit. As long as the natural gas throughput limit and operating hours limit are not violated, there is very little chance that criteria pollutants emission limits will be violated. Therefore, recordkeeping demonstrating compliance with the natural gas throughput limit and operating hours limit can also be used to demonstrate compliance with criteria pollutants, satisfying the periodic monitoring requirement.

Actual emissions from the operation of the heating boiler will be calculated using the following equation:

$$E = F \times N$$

..... Equation 2

Where:

E = Emission Rate (lb/time period)

F = Pollutant specific emission factors as follows:

NO_x = 100 lb/million ft^3

N = Natural gas consumed (million ft^3/time period)

Actual emissions from the operation of the auxiliary generator will be calculated using the following equation:

$$E = F \times N \times H$$

..... Equation 3

Where:

E	=	Emission Rate (lb/time period)
F	=	Pollutant specific emission factors as follows:
	CO =	3.08E-02 lb/hp-hr
	NO_x =	3.08E-02 lb/hp-hr
N	=	operating period
H	=	horsepower rating of the generator

Calculations have been included in Attachment F to demonstrate that if Columbia Gas operates this equipment at design capacity and in accordance with annual fuel throughput/hours of operation limitations, then the emission limits will not be violated.

There is no monitoring for the visible emission limit. As long as the natural gas fired boiler and generator are operated properly, it can be assumed that the opacity limitations will not be violated. Conditions A.8 and B.2 (Part IV) have been added for proper operation and maintenance of the boiler and generator. Maintenance of records demonstrating that the operators have been properly trained along with the maintenance of operating procedures will ensure compliance with the opacity limitation and satisfy the periodic monitoring requirements.

Compliance Assurance Monitoring (CAM) Plan Applicability:

The CAM plan does not apply to the boiler and generator, as these emission units do not use a control device to achieve compliance with the emission limitations.

Testing

The permit does not require source emission tests. A table of test methods has been included in the permit if testing is performed. The Department and EPA have authority to require testing not included in this permit if necessary to determine compliance with an emission limit or standard.

Reporting

No specific reporting has been included in the permit.

Streamlined Requirements

There are no streamlined requirements for the boiler and generator.

GENERAL CONDITIONS

The permit contains general conditions required by 40 CFR Part 70 and 9 VAC 5-80-110, that apply to all Federal operating permit sources. These include requirements for submitting semi-annual monitoring reports and an annual compliance certification report. The permit also requires notification of deviations from permit requirements or any excess emissions, including those caused by upsets, within four daytime business hours after discovery.

STATE ONLY APPLICABLE REQUIREMENTS

Columbia Gas Transmission Corporation did not identify any state-only requirements in their application, and all requirements in their minor NSR permits are federally enforceable. Therefore, no state-only requirements have been included in the permit.

FUTURE APPLICABLE REQUIREMENTS

Columbia Gas Transmission Corporation did not identify any future applicable requirements in their application, and the staff are unaware of any applicable requirements that the facility could become subject to during the life of the Title V permit. Therefore, no applicable requirements have been included in the permit.

INAPPLICABLE REQUIREMENTS

The nitrogen monitoring requirements of 40 CFR 60, Subpart GG, §60.334 has been waived in accordance with letter dated 8/14/87 from EPA Region III (Attachment G)

In addition, 40 CFR 63 Subpart YYYY, National Emission Standards for Hazardous Air Pollutants for Stationary Combustion Turbines, is not an applicable requirement for the Columbia Gas Transmission Corporation - Shenandoah Compressor Station. This standard applies to existing combustion turbines located at a major source of hazardous air pollutants (HAPs). This facility is not a major source of HAP emissions (10 tons/yr for individual HAPs or 25 tons/yr for combined HAPs).

COMPLIANCE PLAN

The facility is currently in compliance with all applicable requirements. No compliance plan was included in the application or in the permit.

INSIGNIFICANT EMISSION UNITS

The insignificant emission units are presumed to be in compliance with all requirements of the Clean Air Act as may apply. Based on this presumption, no monitoring, recordkeeping or reporting shall be required for these emission units in accordance with 9 VAC 5-80-110.

Table IV. Insignificant Emission Units

Emission Unit No.	Emission Unit Description	Citation[1]	Pollutant(s) Emitted (5-80-720 B)	Rated Capacity (5-80-720 C)
AO1	Pipeline Liquids Tank	9 VAC 5-80-720 B	VOC, benzene, ethylbenzene, hexane, toluene, xylene	1,000 gallons
AO2	Pipeline Liquids Tank	9 VAC 5-80-720 B	VOC, benzene, ethylbenzene, hexane, toluene, xylene	1,000 gallons
AO3	Water Mixture Tank (Wastewater)	9 VAC 5-80-720 B	VOC	1,000 gallons
FUG	Equipment Leaks and Blowdown	9 VAC 5-80-720 B	VOC	-

[1]The citation criteria for insignificant activities are as follows:

9 VAC 5-80-720 A - Listed Insignificant Activity, Not Included in Permit Application
9 VAC 5-80-720 B - Insignificant due to emission levels
9 VAC 5-80-720 C - Insignificant due to size or production rate

CONFIDENTIAL INFORMATION

The permittee did not submit a request for confidentiality. Therefore, all portions of the Title V application are suitable for public review.

PUBLIC PARTICIPATION

A public notice regarding the draft permit was placed in the Page News & Courier, Luray, Virginia, on January 15, 2004. EPA was sent a copy of the draft permit and notified of the public notice on January 13, 2004. West Virginia, the only affected state, was sent a copy of the public notice in e-mail dated January 15, 2004. All persons on the Title V mailing list were also sent a copy of the public notice in e-mail dated January 15, 2004.

Public comments were accepted from January 15, 2004 to February 17, 2004. No comments were received from the public, the affected state and the EPA regarding the draft permit.

Emission Calculations for the Turbine:

Design Rating: 5027 hp

1. Hourly limitations during the ozone season of April 1 through October 31:

Pollutant	Emission Factor (lb/hp-hr)	Emissions* (lb/hr)
SO_2	1.22E-04	0.61
NO_x	3.17E-03	15.9
CO	2.23E-03	11.0
VOCs	1.28E-04	0.64

* Emissions calculated using the design rating of the turbine

2. Hourly limitations during the outside ozone season from November 1 through March 31

Pollutant	Emission Factor* (lb/hr)	Limitations (lb/hr)
SO_2	0.62	0.62
NO_x	29.1	29.1
CO	13.0	13.0
VOCs	0.74	0.74

* Emission Factor based upon manufacturer's recommendation during cold season

3. Annul Emissions :

Pollutant	Emission Factor (lb/hp-hr)	Emissions* (tons/yr)
SO_2	1.22E-04	2.67
NO_x	3.17E-03	69.8
CO	2.23E-03	49.0
VOCs	1.28E-04	2.8

*Annual emissions calculated with design rating of 5027 hp and 8760 hours of operation

Emission Calculations for the Auxiliary Generator:

Design Rating: 135 hp
Permitted operating hour: 168 hours per year

Pollutant	Emission Factor (lb/hp-hr)	Emissions* (lb/hr)	Emissions** (tons/yr)
NO_x	3.08E-02	4.12	0.35
CO	3.08E-02	4.12	0.35

*Emissions calculated using design rating of 135 hp
**Emissions calculated with permitted 168 operating hours

Emission Calculations for the Heating Boiler

Boiler Design Capacity: 2.1 MMBtu/hr

Pollutant	Emission Factor (lb/MMft3)	Hourly Throughput (MMft3/hr)	Emission (lb/hr)	Emission* (tons/yr)
NO_x	100	0.0021	0.21	0.92

*Emissions calculated at the boiler capacity

Fuel Consumption Calculations for the Turbine

1. Ozone Season (April 1 through October 31)

Assuming operating temperature of 53.7^0F
Maximum fuel capacity per turbine (at 5027 hp)= 44,883,000 Btu/hr (based on LHV of fuel)
Lower Heating Value of fuel (natural gas) = 936 Btu/ft^3

Maximum burn rate = (44,883,000 Btu/hr) / (936 Btu/ft^3) = 47,952 ft^3/hr
Maximum fuel rate allowed (assuming 4% variation in natural gas heating content) = 47,952 x 1.04 = 49,870 ft^3/hr

Maximum annual fuel rate allowed = 47,952 $ft^{3/}$/hr x 8760 hr/yr = 420 x 10^6 ft^3/yr

2. Non-ozone Season (November 1 through March 31)

Assuming operating temperature of -20^0F
Maximum fuel capacity per turbine (at 5810 hp) = 51,951,000 Btu/hr (based on LHV of fuel)
Lower Heating Value of fuel (natural gas) = 936 Btu/ft^3

Maximum burn rate = (44,883,000 Btu/hr) / (936 Btu/ft^3) = 55,503 ft^3/hr
Maximum fuel rate allowed (assuming 4% variation in natural gas heating content) = 55,503 x 1.04 = 57,723 ft^3/hr

Allowable NO_X Emissions (as per NSPS):

Allowable NO_x emissions shall not exceed the following:

$$STD = .0150 \frac{14.4}{Y} + F$$

where:

STD	=	Allowable NO_x emissions (percent by volume at 15 percent oxygen and on a dry basis).
Y	=	Manufacturer's rated heat rate at manufacturer's rated peak load (kilojoules per watt hour), or actual measured heat rate based on lower heating value of fuel as measured at actual peak load for the facility. The value of Y shall not exceed 14.4 kilojoules per watt hour.
F	=	NO_x emission allowance for fuel-bound nitrogen as defined in 40 CFR 60.332 (a)(3)

1. Ozone Season (April 1 through October 31)

   Y = 44883000 Btu/hr x 1054.68 Joule/Btu x 1 KJ/1000 J x 1/5027 x 1hp/745.7W = 12.6279 KJ/w-hr

   F = 0

   STD = 0.0150(14.4/12.6279) = 0.0171 % volume = 171 ppm

2 Non-ozone season (November 1 through March 31)

   Y = 51951000 Btu/hr x 1054.68 Joule/Btu x 1 KJ/1000 J x 1/5810 hp x 1hp/745.7W = 12.6466 KJ/w-hr

   F = 0

   STD = 0.0150(14.4/12.6466) = 0.0171 % volume = 171 ppm